Technological capability building in MNE-Related social businesses of less developed countries : the experience of Grameen-Danone foods in Bangladesh

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Technological Capability Building in MNE-related Social Businesses of Less Developed Countries: The Experience of Grameen-Danone Foods in Bangladesh[1]

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ABSTRACT
Although there has been considerable research on firm-level technological capability building in the context of developing economies, there is a scarcity of studies which examine this issue in multinational enterprises' socially motivated businesses located in less developed economies. This paper examines the latterissue on the basis of first-hand empirical evidence derived from an extensive field research on Grameen-Danone Foods Limited (GDFL) in Bangladesh. The study found that GDFL generated relevant spillovers to the host economy by accumulating production capabilities in association with innovation capabilities at intermediate levels across four technological functions: project management, process and production organization, product centred and equipment-related. Apart from revealing the types of frugal and reverse innovations which emanates from such a business, our study also explores – unlike existing studies which only focus on the financial and social benefits – the technological benefits generated froma social business model.Understanding the nature and dynamics of technological activities in social businesses of less developed economies is relevant for the achievement of enhanced local, autonomous and sustainable economic and social development.

KEYWORDS: Technological capability building, MNE subsidiaries; social businesses, entrepreneurship; bottom of the pyramid; less developed countries; Bangladesh.

JEL CODES: M16, O32, Q16, Q18

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1. Introduction

In this paper we are concerned with technological capability development at the level of social businesses located in less developed countries. Studying technological capability accumulation in social businesses is relevant from at least three perspectives. First, over the past several years there has been a profusion of studies on technological capability development in firms from developing and emerging economies, known as latecomers. Existing studies have contributed to our understanding of the paths, sequences and, to some extent, the time scales involved in the process of technological capability accumulation. However, most studies have focused on the conventional business manufacturing organizations which competes or seek to compete in global markets on the basis of increasingly innovative and sophisticated products, processes and production systems in fast growing developing and emerging economies of Latin America, Southern Africa, and South East Asia. Little (if anything) has been researched in terms of the process of technological capability building in non-firm organizations especially in the context of less developed nations. Understanding the process of technological capability building at the level of social business organizations, is important to expand our understanding of the process of economic and industrial development and social change, especially in the context of less developed countries.

Second, most of the studies on multinational enterprises' (MNEs) technological capabilities in contexts other than those of advanced economies have been in fast-growing developing and emerging economies where the subsidiaries are engaged in technological activities with increasing levels of technical sophistication and commercial aspirations towards global markets. There is scarce empirical evidence about the manner in which MNE subsidiaries undertake technological activities in social businesses, especially in the context of less developed countries. Additionally, most of the existing studies on MNE subsidiaries in developing countries neglect the fact that the subsidiaries may become sources of important spillovers to the host country (Marin and Bell, 2006).

Third, over the past few years, there has been a growing attention on the emergence of social business models in the context of developing countries (see, for example, Yunus et al., 2010). However, although there has been interest in the social and financial benefits of social business models in less developed countries, we know little about whether - and the extent of - technological capability accumulation at the level of social organizations in such a context and, consequently, we know little about their implications for local industrial development.

In this paper we examine the issue of technological capability development at the level of a social business in the context of a less developing country. To that end, we draw on first-hand evidence derived from original and extensive fieldwork centred on the experience of the Grameen-Danone Foods Limited (GDFL) in Bangladesh. This paper is structured as follows. In Section 2 we present a comprehensive review of the existing research on technological capabilities, thus leading to the research question of this paper. In Section 3 we briefly describe the empirical context where our study was implemented. Section 4 contains the conceptual framework against which our empirical evidence will be examined. Our research methodology is presented in Section 5 followed by the empirical findings in Section 6. In Section 7, we outline the paper's discussions, conclusions and implications.

2. Literature Review and Research Question

In addition to the reasons outlined in the previous section, our interest in addressing the theme of technological capability at the level of a MNE-related social business in the context of a less developed country is embedded in previous research, which we review below.

2.1 Nature of firm-level studies of technological capability building in developing countries

The first refers to the *nature* of the evolution of the studies on technological capability building in the context of developing and emerging economies. Indeed, this research field began to emerge as a reaction to narrow perspectives on technology in the context of developing economies that prevailed during the 1960s. The view that the technological role of firms and industries in developing countries was passive and involved the mere operation of externally supplied technologies was endorsed, so to speak, by the 'dependency' school of thought. By claiming a perpetual technological dependence of the peripheral developing countries on capital goods imported from 'central' economies, the representatives of this school of thought implied the absence of creative technological activities in firms and industries in developing countries. Given the strength and pervasiveness of such views in the academic and policy debates at the time, it was not surprising that there was little research interest in searching for, and unearthing the creative aspects of,technological change in developing countries (see Lall, 1987, 1992; Bell and Pavitt, 1993;Bell and Albu, 1999; Bell 2006).

This view gradually changed as a group of researchers began to develop a broader and dynamic view on technology in developing economies. They rejected the previous views of non-creative industrial technological activity in developing countries. In the early 1970s, Charles Cooper in the UK sought to understand how the mechanisms of international technology transfer influenced the long-term accumulation of change-generating capabilities in technology-importing firms and industries. In line with this view, Stewart and James (1982) adopted a dynamic perspective of technology in firms based in developing countries. However, it was a Latin American group of researchers, led by Jorge Katz,who initiated the first substantial and systematic research program on these issues in the mid-1970s. Drawing on a wealth of detailed plant-level studies, they demonstrated that significant innovative activities *did* take place in a wide range of industries. They also scrutinized, initially across Latin America (Katz, 1976, 1987) and Asia (Bell et al., 1982; Lall, 1987)[4], the nature and dynamics of the various learning mechanisms by which firms built up – or failed to build up –innovative technological capabilities *over time*. By doing so, they unveiled several aspects of technological dynamism and creativity in firms of developing economies. In particular, they explored the important role of learning mechanisms in influencing the manner and speed at which latecomer firms built up and accumulated their innovation capabilities and therefore determine whether they were able to catch up with global innovators. However, during the 1980s the issues of learning and capability building disappeared from the research agenda of latecomer firms and industries.

During the mid-1990s a new generation of studies emerged that sought to explore the role of learning mechanisms in the capability accumulation of firms in emerging economies, especially in the fast-growing and fast-industrializing East Asian countries and later in Latin America. However, researchers' interests in examining the issues of learning and capabilities in latecomer firms were influenced by a great emphasis and profusion of studies on learning and capabilities as sources of competitive advantage in the context of highly innovative firms in advanced economies. Since the early 2000s there has been the emergence of studies which captured innovation capabilities at the

[4] For a review of the evolution of this research field, please see Bell (2006).

level of clusters and knowledge systems (Giuliani and Bell, 2005; Dantas and Bell, 2011). However, most of the contributions in this field havecentred on firms that target competitive markets on the basis of progressively advanced technologies and higher innovative products. Consequently, we know little about the process by which technological capabilities are accumulated in social business organizations.

2.2 Directionality of innovation efforts towards low-income consumers and their needs

In relation to our second source of motivation, over the past few years at least two types of directionality of innovative activities have been observed in latecomer firms. More specifically, these are: (i) the orientation of factor use and factor saving; and (ii) the orientation of innovation towards low-income consumers and their needs. There has been scarce research related to these types of innovation directions, however, we are concerned with the second type of directionality. Indeed, in recent years, questions about innovation and the direction of factor-use and factor-saving have re-emerged, with an emphasis not on capital and labour, but on energy, materials and other environmental/natural resources. Initially, the growing attention given to innovation and the environmental impact of technology focused heavily on end-of-pipe solutions, which were typically highly capital-intensive technologies used to reduce environmentally damaging outputs. However, attention shifted towards the importance of 'win-win' technologies – new product and process configurations that reduce both costs and environmental damage. Thus, progressive deepening of the innovation capabilities of latecomer firms may contribute to relatively 'green' directions of industrial development.

In relation to the second type of innovation, the orientation to low-income consumers and its implications for poverty reduction – an important thread in the analysis of 'appropriate' directions of technical change in the 1970s – was concerned with the appropriateness of products, not just the relative capital and labour intensity of processes. It focused on the design of products and their consequent features and functions. The issue was seen as important for two reasons. First, product specifications frequently determine process specifications, thereby contributing to employment intensity in production. Second, the specifications of products influence their prices; and product innovation can be pursued in specific directions to simplify ‘excessive’ complexity, reduce prices and hence raise the real income of consumers, especially low-income ones.

These ideas have recently been rediscovered. In particular, Prahalad (2006) has again identified the ‘inappropriate’ nature of product technology for consumers at the bottom of the pyramid. What is needed is a new direction of innovation to meet the needs of low-income consumers. Examples of such redirection of innovation have been identified by Zheng and Williamson (2007) in what they describe as the patterns of ‘cost innovation’ pursued by Chinese firms. This is similar to the ‘reverse innovation’ (Immelt, Govindarajan, and Trimble, 2010) and ‘frugal innovation’ (Woolridge, 2010)approaches. These approaches have not only been about using established techniques to produce existing types of product at low costs based on low factor prices. It has also been about drawing on innovation capabilities to create unique competitive positions in low-income markets based on ‘new’ products that are *less* technologically complex than equivalent products produced by firms in advanced economies, such as the Nano car designed and developed by Tata. It also involves innovating in products and solutions, primarily in emerging markets, to serve both developing and advanced nations such as the electrocardiograph device for rural India and the ultrasound machine for rural China, which are now being sold in the USA for pioneering new applications. In this paper we are concerned with this second type of ‘direction’ of technological capabilities.

2.3 MNE-subsidiaries themselves as generators of spillovers into their host countries

Over the past two decades numerous studies have examined how MNE subsidiaries actively engage in knowledge leveraging and creation in local contexts to compete locally and/or globally (Almeida and Phene, 2004; Birkinshaw and Hood, 2000; Birkinshaw et al., 1998). These studies have also shown that subsidiaries vary in the manner in which they enhance their capabilities to innovate in products, production processes and services in host locations. For instance, subsidiaries may engage in different types of innovative activities in product adaptation to local needs and in sophisticated high-technology projects (Cantwell and Mudambi, 2005).

Such activities undertaken by subsidiaries reflect the different kinds of mandates they attain over time. These may range, for instance, from ‘product specialists’ to ‘worldwide’ mandates

(Birkinshaw et al., 2000) and ‘competence-exploiting’ and ‘competence-creating’ type of mandates (Narula and Zanfei, 2005; Cantwell and Mudambi, 2005; Cantwell and Kosmopoulou, 2002; Cantwell and Piscitello, 1999). Studies have also examined how subsidiaries engage in different linkages to leverage knowledge from local contexts to carry out their R&D and high-technology projects. However, Yamin and Otto (2004) point to the need for more empirical analyses of the impact of knowledge flows on subsidiaries’ innovative capabilities.

From the 1990s some emerging economies in Asia, Eastern Europe and Latin America have become important sources of creative knowledge and have attracted MNE investments in sophisticated technological activities. But to what extent studies focusing on subsidiaries in highly industrialised economies are different from those in emerging and developing economies? In most studies centred on subsidiaries from technologically advanced locations, advanced and world leading innovative capabilities *already exist*. Researchers are concerned with how these firms *exploit* and *augment* such given cognitive resources in order to push the international technological frontier forward. Thus, it is understandable why researchers track subsidiaries’ innovative performance on the basis of cross-sectional analyses derived from patent citations and R&D expenditures. However, in order to tackle the issue of innovative performance and its sources in subsidiaries operating in developing and emerging economies, different analytical lenses and evidence are needed. Why?

As pointed out in Bell and Figueiredo (2012), MNE subsidiaries, like domestically-owned firms, have become embedded in, or at least have access to, increasingly pervasive international networks of *potential* sources of technology. Their competitive disadvantage lies on their initially limited internal capabilities for exploiting available sources of technology in order to implement innovation in their own production activities. Consequently, firms operating in such contexts, including MNEsubsidiaries, are characterised by being an ‘initially imitative’ firm, regardless of how dislocated they may be from markets and technology sources. This is consistent with perspectives that have identified subsidiaries not simply as strategically passive components of hierarchical corporate structures, but as potentially active enterprises in their own right that may significantly shape their own paths of development at the interface between local economies and global corporate networks (Birkinshaw et al., 2005; Cantwell and Janne, 1999; Birkinshaw et al., 1998).

Like domestically-owned firms, they may move from such ‘initially imitative’ positions to others where they pursue significantly more innovative patterns of behaviour. There is also considerable heterogeneity among them in terms of the extent to which this pattern occurs (Boehe, 2007; Marin and Bell, 2006; Cantwell and Mudambi, 2005). Consequently, one of the critical tasks for researchers is to understand the extent to which subsidiaries move from the accumulation of *production* capabilities (or purely imitative capabilities) to the accumulation of different degrees of *innovation* capabilities in order to achieve international levels of innovative performance.

Consequently, proxies like patent citations and R&D expenditures and one-point-in-time kinds of research designs are not helpful to tackle this issue in the context of subsidiaries operating in developing and emerging economies. Unlike leading subsidiaries and local firms in technologically advanced locations, they do not simply exploit existing knowledge to do innovation near or at the international technological frontier. They first need to engage in different types of knowledge-acquisition processes *to learn* how to undertake production and basic levels of innovative activities (Kim, 1998; Bell and Pavitt, 1995).

One of the expectations of MNEs operating in developing locations is that they generate spillovers into the host economy. There are several approaches to MNE spillovers. The prevailing approaches adopt a limited view on spillovers generated by subsidiaries in their host economies (see Marin and Bell, 2006 for a detailed critique of such approaches). With respect to this issue, we follow Marin and Bell (2006) and Giroud et al. (2012) by adopting a ‘bottom-up’ perspective on MNEsubsidiaries in terms of generation of spillovers to their host economies. On the basis of this perspective, MNE-subsidiaries themselves are potential sources of spillovers to their host economies. Specifically, a large part of the technological potential for spillovers is generated within the MNE subsidiary in the host country on the basis of its own technological capability building process (Marin and Bell, 2006). However, there is scant empirical evidence (if any) of this phenomenon in MNE-related social business models. In this paper, we seek to move further into this direction.

Therefore, in light of these two motivations this paper focuses on this central question: what has been the nature of technological capability building in a social business organization located in a less developed economy? We will examine this question in the context of GDFL in Bangladesh. The case study and the country offer a rich empirical context to explore this issue and to draw management and policy-oriented implications for development in low income locations.

3. Empirical Context and Background

Present in 52 countries through more than 180 subsidiaries, while being the world's largest producer of fresh dairy products, Europe's largest producerof medical nutrition and the world's second largest producer of baby nutrition and bottled water, it is axiomatic that Danone, a large French MNE has world-leading innovative capabilities across diverse technological functions. As a result, Danone enjoys a leading technological positionnot only in the context of advanced economies, but also worldwide. Even so, Danone has taken the initiative to develop a social perspective in its business activities by engaging in a partnership with the Grameen Group to create the GDFL. This action seems to reflect Danone's concern with the implications of its business and its technological innovation for social development. Indeed, GDFL is unique not only to Danone but to the world.

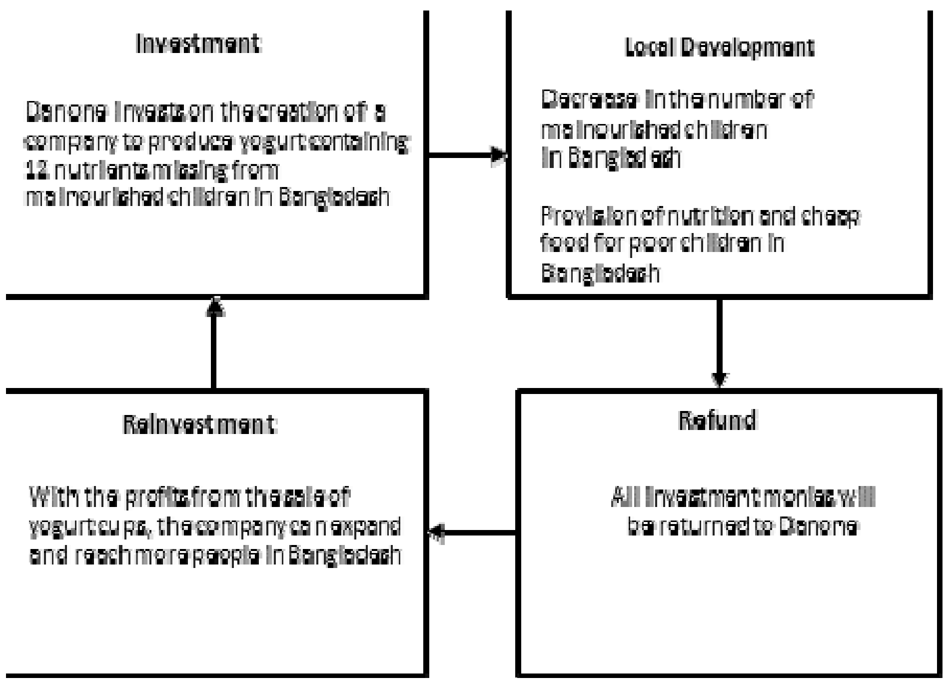
Bangladesh is a country where malnutrition is present in 30 per cent of the population. The child mortality rate is of 7 per cent and approximately 60 per cent of the population lives on less than US$2 a day. In light of this critical context, the GDFL project has the goal of enhancing nutrition quality of the Bangladesh's population. GDFL was established on 16 March 2006, following the signing of a memorandum of understanding between Danone Group and four Grameen companies namely Grameen Business Promotion Services, Grameen Welfare, Grameen Energy and Grameen Telecom. As such, GDFL is a joint venture (JV) between Danone and its four Grameen partners. The social business is located in Betgari, a village on the outskirts of Bogra City in Bogra District, about 140 miles northwest of Dhaka. Following its inauguration in November 2006, the plant started production in February 2007[5]. Its head office is located in Dhaka, where the Managing Director - Corinne Bazina - oversees the support activities such as sales, marketing, human resources and finance.

Within the Danone Group, GDFL is managed by 'danone.communities', an investment fund, created to support businesses which aim to be sustainable whilst making social and societal goals their objective. GDFL's mission is to reduce poverty by a unique proximity business model that will

[5] For a detailed account of how the GDFL was conceptualized, please refer to Yunus (2008, 2010).

provide daily healthy nutrition to the poor of Bangladesh (danone.communities, 2012). The 50-50 social business JV covers the manufacturing, packaging, marketing, sales and distribution of fresh sealed yoghurt products under the Bangladeshi brand name 'Shokti+' (or 'Shokti+Doi' which translates into 'Power+Yoghurt'). The yoghurt was conceived based on the nutritional needs of Bangladeshi children – GDFL's targeted consumer group – and contains Vitamin A, Zinc, Iron and Iodine, all of which were determined as lacking in the local population's diet based on a study conducted by the non-governmental organization Global Alliance for Improved Nutrition (danone.communities website). The Grameen-Danone business model is represented in Figure 1.

Figure 1.The GDFLSocial Business Model



Source: Adapted from Yunus et al. (2010) and www.grameensocialbusiness.org

The aim of this social business, as per Professor Yunus' seven principles of social business is to create a no loss, no dividend business. "*Investors get back their investment amount only. No dividend is given beyond investment money. When investment amount is paid back, company profit stays with the company for expansion and improvement*" (YunusCenter, 2012). Guy Gavelle described by Professor Yunus (2010:56) as "*Danone's gifted engineer/designer*" is the Industrial Director of Danone Asia Pacific operations with 40 years of industry experience. He was called upon by Professor Yunus and Franck Riboud, Danone's CEO, to conceive the GDFL plant from scratch. GDFL was created to supply *"3000 tons of yoghurt per year to 3 million inhabitants in Bogra within a radius of 30 to 50 Km. Knowing that there are 150 million people in Bangladesh, the plan is to eventually have 50 factories across the country each supplying within their own 30 to 50 Km radius"* (Guy Gavelle). Thus, the profits earned by GDFL in Bogra will be used down the line to build the next factory and the process will continue until the other 49 factories are eventually built.

4. Accumulation of Technological Capabilities in Latecomer Organizations

4.1 What are technological capabilities and how to assess them?

Firms' capabilities include a stock of resources which permit them to undertake *production* and *differing degrees* of innovation activity. Such capabilities both involve the nature of 'human capital' (i.e., specialist professionals, knowledge bases and skills/talents that are formally and informally allocated within specific organisational units, projects and teams) and 'organizational' aspects (the firm's internal and external organizational arrangements such as their routines and procedures, linkages, and managerial systems) (Bell and Pavitt, 1993; Kim, 1997;Dutrénit, 2000;Teece, 2007). In line with previous relevant studies (Bell and Pavitt, 1993, 1995; Choung et al., 2006), this paper distinguishes between *production-based* and *innovation* capabilities and focuses on the latter.

With regard to the operationalization of the capability building construct, over the past two decades, in the context of advanced economies the assessment of innovation capabilities has been heavily based on quantitative measures such as R&D intensity and expenditures and patent counts/citations (Hagedoorn and Cloodt, 2003). Although it has been recognised that such measures have limitations as proxy indicators of innovative activity (Teece, 2007), they have been widely used in the innovation literature. However, such indicators reflect situations in which significantly deep levels of innovative capability already exist. Such measures, therefore, reveal little about the prior process of developing and accumulating capabilities up to the point at which they begin to generate measurable R&D activities or officially recorded patenting. Thus, these measures are not well suited for capturing data on latecomer firms on pathways of innovative capability building (see Bell, 2006;Bell and Pavitt, 1993; Lall, 1992). Tackling such a process is crucial for the study of innovation capability within latecomer firms.

Consequently, in this paper, we adopt an approach that has been the primary basis of research for this area since the earliest studies on the innovation capabilities of latecomer firms (Katz, 1987; Lall, 1987; Lall, 1992). This approach involves the direct acquisition of descriptive information on firms' technological *activities*. Differences in the qualitative characteristics of these activities have been deemed to reflect differing categories of underlying technological capabilities. The focus on *activity* reflects a concern with process and dynamics.

Specifically, this paper draws on a modified version of the typology developed in Lall (1992) and further refined in Bell and Pavitt (1995). The modified version of this typology identifies 'levels' of innovative capability that range from 'basic' to 'world leading' and are consistent with the characterisation of innovation as *degrees of novelty* (new to the firm, new to the economy and new to the world) and complexity in terms of technological activities thus consistent with the Oslo Manual (see OECD, 2005). Such a typology has been used extensively and successfully in studies, with different degrees of capability level disaggregation, which have reconstructed historical paths of capability accumulation over considerable time periods (Dutrénit, 2000; Figueiredo, 2002, 2010; Dantas and Bell, 2009). Studies have also covered histories of capability accumulation in a much larger number of firms, although over shorter time periods (Hobday et al., 2004; Tsekouras, 2006; Iammarino et al., 2008; Ariffin and Figueiredo, 2004; Ariffin, 2010; Yoruk, 2011; Figueiredo, 2011; Peerally and Cantwell, 2011, 2012). Rather than identifying capabilities in terms of the specific resources entailed therein, these works have identified levels of innovative *activity* and then inferred the various levels of capability that underlie patterns of *innovative performance*. A summary of the typology tailored for use in this paper is provided in Table 1. The first column shows four levels of innovative performance that extend from 'basic' to 'world leading'; the second column provides illustrative examples of these levels of capability.

Table 1: A Framework for Assessing Technological Capabilities in a Social Business of the Dairy Industry

Levelsof Technological Capabilities	Project Management	Product Centered	Process and Production Organization	Equipment and Machinery
Innovation Capabilities: Capabilities to change technologies and production system				
Level 4 ADVANCED INNOVATION CAPABILITY	Involves full capabilities in coordinating, supporting and managing the development of new production systems and components. Involves full capabilities in providing project management services, turnkey solutions and advanced training to subsidiaries.Basic E of individual facilities, expanding plant without technical assistance, procurement E (specifications, project analysis), plant commissioning, intermittent provision of technical assistance.	R&D related to process and production organization for designing, selecting and upgrading yoghurt and dairy manufacturing/processing techniques for specific end uses.Develop full-scale new production processes and standards.	Set up R&D centre for generating innovative dairy products and related technological skills (product attributes). Related product R&D in creating cost-effective and highly nutritious yoghurt and dairy products.	Set up of R& D centre for the design of original equipment and development of new dairy technologies.
Level 3 INTERMEDIATE INNOVATION CAPABILITY	Search, evaluation and selection of technology and raw material sources. Undertaking tenders and negotiations. Full monitoring, control, and execution of: feasibility studies, search, evaluation, and selection, and funding activities. Own overall project outline and execution, providing technical assistance in expansion decisions and negotiations. Project management of joint venture.	Sampling unit for creation of yoghurt (and/or other dairy products) and facilitating their production feasibility studies. Reduction in defects rates. Reduction in waste.Continuous improvements in own specification without technical assistance, product development certification (e.g. HACCP) and involvement in world projects.	QC Certification and Audits. Systematic improvements in given specifications, systematic ‘reverse engineering’, technically assisted design and development of production process and developing own product specifications.	Original use of equipment and machinery. Large equipment revamping without technical assistance, detailed and basic reverse E, large equipment manufacturing. Preventive maintenance. Continuous basic and detailed equipment E and manufacturing of whole facilities and/or components for other industries, continuous technical assistance to other social businesses.
Level 2: BASIC INNOVATION CAPABILITY	Active monitoring and control of feasibility studies, technology choice, technology sourcingand project scheduling. Running feasibility studies before choosing and buying technology. Providing project management services to primary and support departments. Broad outline of project planning, technically assisted feasibility studies for major expansions, standard equipment procurement. Installations E (civil and electricity, piping, mechanical, metallic, refractors structures and architecture), technically assisted expansions, detailed E.	Minor adaptation to local market. Incremental improvement in product quality based on informal feedback from clients, PC and SCs. In-house QC to maintain existing quality standards.	Integrated automatic/semi-automatic processes in production. Minor adaptation to processes and production.Internal defect rates measurement.Reduction or improvements of delivery times.	Modification of equipment and machinery such as in-house adaptation to spare parts in production equipment. In-house repair and troubleshooting of equipment.
Production Capabilities: Capabilities to use existing technologies and production systems				
Level 1: OPERATION CAPABILITY	Basic activities such as engaging prime contractor, deciding on plant location and disbursing finances from bank in setting up new production plant. Preparation of initial project outline. Synchronizing construction with installation works.	Replication of product samples from PC. Product quality enforced QC systems (through PC or local regulations).	Routine operation and testing. Basic maintenance of given facilities. Basic production planning and QC.	Maintenance awareness and systematic preventative measures. Servicing of unchanging items of plant and machinery. Replication of simple equipment spare parts.

Sources: Adapted from Lall (1992), Bell and Pavitt (1995) and Figueiredo (2001) and based on authors’ own research and elaboration.
Keys: E: Engineering; PC: Parent Company; SC: Sister Company; QC: Quality Control.

Although the above framework emphasises the capabilities that are internal to the firm, it also recognises that a substantial part of a firm's capability to innovate is grounded in the activities of other organisations (e.g., consulting firms, research institutes and universities). Consequently, the development of innovation capability is not necessarily confined within the boundaries of a firm but may instead involve several interdependent actors. However, for the firm to gain access to such a breadth of knowledge, it must develop a substantial level of in-house expertise (Mowery, 1983) or absorptive capacity (Cohen and Levinthal, 1990), as well as a demand for local R&D outputs (Bell, 1993). Such an approach is particularly appropriate when latecomer firms engage in the development of world-leading innovation capability at an *early* stage in their development, as examined herein.

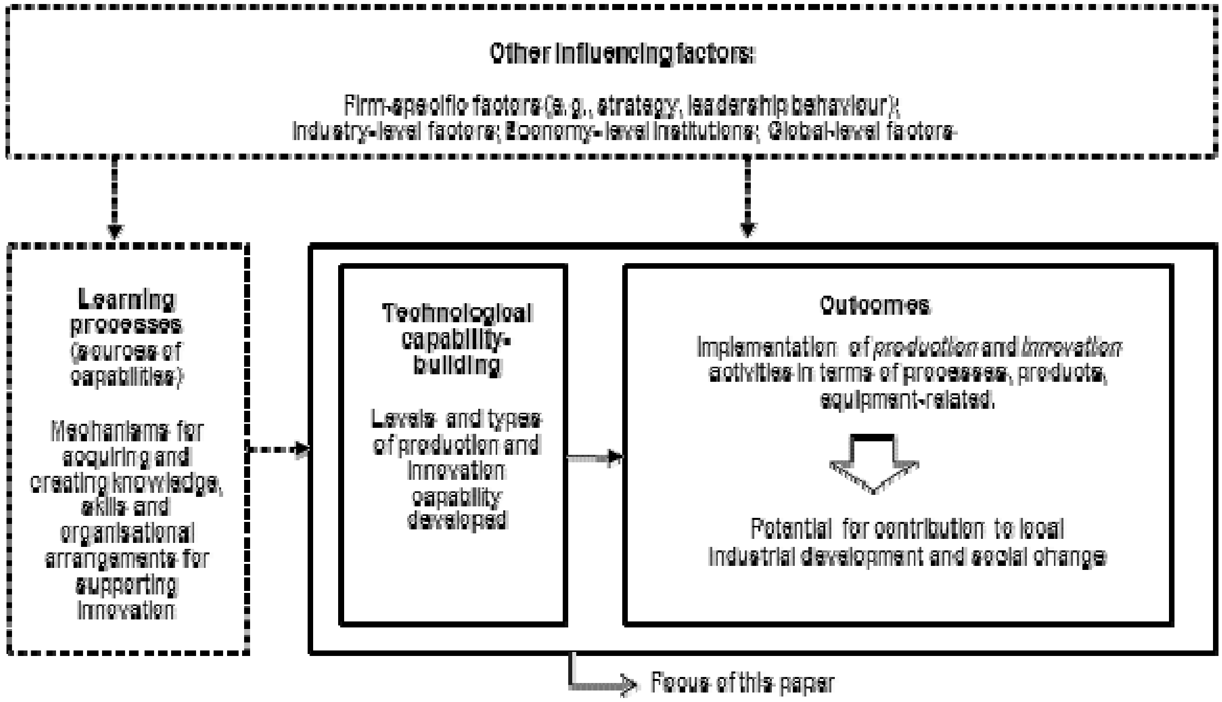
4.2 A social perspective on firms' technological activities

Over the past decades, and particularly during the past few years, there has a growing interest in the social impacts technological capabilities accumulated at the level of firm and industries. Initially, there was concern regarding the impact of technological development on the distribution of income and employment (Stewart, 1978; Kaplinsky, 1990). Since the early 2000s, there has been renewed interest in the impacts of firms' activities, particularly their technological related activities, which extends beyond issues such as capital and labour to focus on energy, materials and natural resources. This interest has been based on a type of win-win technology that reduces both costs and environmental damages. A large portion of the studies addressing these issues have emphasised the role of incremental innovation efforts in achieving these goals. For instance, by drawing on evidence of energy-saving achievements in a cement plant in Thailand and waste-reducing measures in an electronics cluster in Malaysia, Rock and Angel (2005) and Rock et al. (2009) have stressed the importance of engineering-based and incremental innovation in contributing to sustainable impacts of technical change. In other words, it has been argued that latecomer firms' progressive accumulation of innovation capabilities firms may contribute to greener industrial development (Bell and Figueiredo, 2012).

In a similar vein, another perspective involves technology and innovation aspects but either solely in terms ofproduct innovation aimed at the bottom of the pyramid (Prahalad, 2006) orin terms ofcorporate social responsibilityandwider welfare impacts. For instance, through their ‘blended value’ approach, Emerson and Twersky (1996) argue that firms can increase shareholder value by increasing the positive social and environmental impacts of their work while simultaneously addressing the concerns of wider stakeholder groups. Such an approach is consistent with the ‘sustainable value portfolio’ perspective (Hart and Milstein, 2003), in which environmental sustainability and profits are viewed not as trade-offs, but rather as sustainability generating profit. In a similar vein, Porter and Kramer’s (2011) ‘shared value’ approach argues that firms’ achievement of competitive performance involves the creation of economic value in a manner which also creates value for society through social progress. Indeed, as argued in Porter and Kramer (2011), the notion of purposefully centring firms on the creation of shared value instead of profit *per se*, will drive the next wave of innovation and productivity growth in the global economy. However, there is a lack of empirical evidence in support for such perspectives. Indeed, there has been a scarcity of studies that examine the subtle relationship between technological capability building and social impacts, especially from the viewpoint of a social business in a developing country.

By drawing on the above studies and in relation to the research question previously outlined, we argue that a MNE-related social business in the context of a less developed location may engage in the accumulation of technological capabilities for production and innovative activities thus generating benefits in terms of development for the host locations, and therefore creating a basis for local industrial and social development. This kind of relationship constitutes the conceptual framework underpinning this paper, as represented in Figure 2.

Figure 2. Conceptual Framework of the Study



Source: Adapted from Figueiredo (2011); Bell and Figueiredo (2012).

5. Research Methodology

To answer our research question, the design of this study is based on an in-depth case study involving a social business. Such a research strategy proved appropriate for the tackling the research question since it facilitates understanding what lays behind a subtle and under-researched phenomenon whose details and nuances would not be captured by other methods, especially aggregated analysis derived from purely quantitative methods (Eisenhardt, 1989; Strauss and Corbin, 1998; Yin, 2003). Below we outline the research design and methods such as empirical setting, sampling, evidence-gathering strategies and analysis.

5.1 Case study design

Firstly, we use an exploratory case study since our research objectives involve understanding a complex social situation (Creswell, 2003; Yin, 2009). Yin (2009:4) states that case studies allow for an understanding of complex social phenomena whereby the situational conditions are an important aspect of those phenomena. Our study meets both these aforementioned conditions since deploying, acquiring and creating innovative capabilities involve complex social situations and interactions and we seek to understand the latter within a specific situational condition namely a social business. Furthermore, as there are no existing empirical works on innovative capabilities in social businesses, an exploratory approach is deemed most appropriate for providing a better understanding of the research issue at hand (Sekaran, 2003).

The objective of our research is to obtain in-depth information about the *"how"* of innovative capabilities deployment, acquisition and creation in the GDFL case. According to Yin (2009:27), *"how"* questions elicit explanations which are best suited to the case study approach. Furthermore, a case study approach is useful in generating new knowledge in exploratory situations in which there are no clear and single set of outcomes (Patton and Applebaum, 2003). Yin (2009:7) adds that although *"what"* questions are better suited to survey research methods, case study methods can nevertheless be applied when the *"what"* is exploratory in nature.

5.2 Case selection

Eisenhardt (1989), Thiétart (1999) and Evrard, Pras and Roux (2000) state that randomization is not a necessity in selecting cases for a study. To the contrary, cases need to be strategically selected in relation to the relevant theoretical background (Patton and Applebaum, 2003). Researchers must choose the cases with the characteristics needed for an in-depth understanding of the research questions. Thus, we chose a social business which uses manufacturing technology and which produces goods in order to adhere to our theoretical framework.

5.3 Data collection and analysis

One of the main advantages of case-based research is the opportunity to use multiple sources and types of evidence to achieve triangulation.In our study, the main data sources were interviews, published works on GDFL such as peer-reviewed articles and the books written by Muhammad Yunus and internal Danone documents. Data was collected through personal, semi-structured face to face interviews and from non-participant observation between February and March 2012, at the GDFL factory in Bogra. The face-to-face interviews were tape-recorded with the consent of the interviewees and transcribed for analysis. Follow-up interviews were also conducted in Paris during

May 2012. All key management, quality control and production related employees at GDFL were interviewed and as such a comprehensive view innovative capability was obtained. Data analysis was conducted by examining, categorizing, tabulating and recombining (as per Yin, 2009) the data on innovative capability deployment and creation from the time GDFL was created in 2006 to 2012. The goal of our analytic strategy is *"to treat the evidence fairly, produce compelling analytic conclusions, and rule out alternative interpretations"* (Yin, 2009:111). The result of this analysis takes the form of a case study which is presented in the following section.

6. Empirical Findings

In light of the framework in Section 4, this section presents the main empirical findings of our study. We begin by presenting an overview of the findings in Section 6.1 followed by the detailed findings of our case studyrelated to the accumulation of capabilities in Section 6.2.

6.1 Overview of findings

Firstly, our study assesses the innovative capabilities which were accumulated in GDFL from 2006 to 2012. Our findings reveal that GDFL has upgraded to the intermediate innovative capability level across all functions. Such upgrade especially in terms the Production and Equipment Related Functions were primarily due to the social business' efforts since 2010 to create and launch a new-to-the-world diary product, namely a dairy pouch product. Such upgrade is in line with the existing empirical evidence that innovative capability accumulation entails the intensity, persistence and effectiveness with which firms manage and invest in the process of acquiring and creating knowledge bases that they need to conceive and implement the necessary innovative strategies. Furthermore, it highlights the fact that the GDFL subsidiary is not a strategically passive component of Danone's hierarchical corporate structure, but instead is a potentially active enterprise in its own right engaged in significantly shaping its own path of development.

Secondly, in order to analyze the accumulation of capabilities in the GDFL case, it was necessary to present the backdrop against which the social business was created and hence Danone's activities related to the Project Management Functions. From the emerging literature on the role of frugal innovations (for e.g. Immelt, Govindarajan, and Trimble, 2010; Woolridge, 2010 and Tiwari and

Herstatt, 2012), Tiwari and Herstatt (2012:4) for example, define frugal innovations as new or significantly improved products, processes or marketing and organizational methods that seek to minimise the use material and financial resources in the complete value chain with the objective of reducing the cost of ownership while fulfilling or even exceeding certain pre-defined criteria of acceptable quality standards. While there has been significant research on frugal products such as those developed by General Electric, Tata Motors and Siemens not much has been explored with regards to frugal innovations in the processes of latecomer firms. In the case of GDFL, the path for capability accumulation has been determined in large part by Danone's need to follow frugal investments and innovations in its processes primarily. The need to adhere to this premise has in turn led to various mechanisms for frugally dictated innovative capability accumulation both for the parent company – Danone - as well as for the social business subsidiary.

6.2 Accumulation of technological capabilities for specific functions

6.2.1 Capability accumulation for project management activities

Since this was Danone'sfirst venture in creating of a social business, the MNE had only a vague grasp as to the level of investment the project would entail. For premium yoghurt factories, which produce about 50,000 tons per year, with an average cost of €750 per ton, Danone invests about €37,500,000 per factory. Thus, in November 2005 the initial cost for the project was estimated by Guy Gavelle at €1.2 million which seemed low and feasible when compared to premium yoghurt factories. "*At the beginning, we didn't know exactly how much it would cost… We didn't really have an idea of volume since we were treading on virgin territory where we didn't know what we will produce – water, biscuits or yoghurt - and how much… Afterwards, we agreed on yoghurt since this is what Professor Yunus wanted. He really wanted a value-added product in terms of nutrition"* (Guy Gavelle). Thus, despite the MNE's advanced capabilities in the Project Management Functions, it did not have the capabilities necessary for ascertaining the cost of such a venture.

Following initial negotiations and discussions with Professor Yunus and theGrameen JV partners, Danone's Singapore subsidiary conducted the feasibility studies for the GDFL project. The Singapore team revealed that an investment of €1.2 million would imply that GDFL would not amortize or that the yoghurt would have to be sold at premium prices which in turn would defeat the purpose of creating a social business which sells affordable yoghurt. There were other factors to consider as Guy Gavelle explained. *"Despite the fact GDFL would be our entry ticket into Bangladesh, we could not over-commit financially, in case we could not reimburse our loans for building and equipping the factory. And since our sealed yoghurt product, unlike the local MishtiDoi, was a first time product in a country where there is no existing cold chains for dairy products, we could not put down too much money. There were too many risks."* Danone Singapore concluded that an investment of BDT 58 million (€600,000) can be feasibly committed to the project. Hence, between the initial estimate of €1.2 million and a premium factory which would have entailed an approximate investment of €2.25 million for 3000 tons of premium yoghurt per year, the investment was reduced by 50 to 73 percentfor the whole GDFL project including land, building and equipments. Such frugal investment dictated the course of innovative capability development in Danone and GDFL.

Despite having advanced innovation capabilities in project management, Danone relied on its Grameen JV partners to find a suitable site and contractors for the plant. The specifications for the site provided by Danone included surface area, non-floodable, accessible by road, a river close by for the purification station, access to non-contaminated water and gas and electricity mains. However, Imamus Sultan (Representative of the Grameen JV partners) was called upon to help Danone overcome issues related to liability of foreignness (Zaheer, 1995). As explained by Guy Gavelle, *"It took us quite a while to find a site since once you carry the name Grameen-Danone, well Grameen first, it's a bank, it's perceived as having money - the prices rise. And when you find the land, you are told by the sellers that there are no problems to sell, but in the end you find out that the land is owned by 20 people, there are no deeds and there is always one seller who is not willing to sell. So Grameen managed the problems related to the land purchase"*. This demonstrates that a socially motivated initiative by a large multinational enterprise is just as susceptible to liability of foreignness. In 2006, the site was selected and construction began in July 2006 and completed four months later.

In parallel, Danone worked on the project management aspect of GDFL in terms process and production technologies. With regards to the process design and the purchase of process equipments, Guy Gavelle ventured outside the usual external network used by Danone. He explained that for premium factories at around €20,000,000 to €37,500,000, Danone uses large

MNEs from England, France and Germany as integrators and suppliers. He also conceded that, *"Even if these European integrators and suppliers have subsidiaries in China, they are expensive since they are managed by foreigners. The price you will pay just in terms of project management and process design with these large multinationals will be the same as the price of the Bogra factory!"* Consequently, an independent domestic integrator from Nanjing (China) was enlisted to draw up the process for GDFL. Although the company was aMNE, it was deemed appropriate since the owner and integrator had worked in Germany for several years and had excellent expertise in process design. The design process for GDFL was drawn up in collaboration with Danone so that it would be as simple as possible.

Danone also focused on additional cost-cutting measures for the social business such as reducing energy consumption. The standard industry yoghurt making process requires a substantial amount of energy especially with the heating and cooling involved in steps 2, 5 and 7 of the process. After fermentation, cooling the yoghurt down to 20^{o}C is vital in order to maintain its pH at 4.5 and prevent the product from over-fermenting. Danone's Paris R&D department was requested to create a culture which will be used at step 6 of the process and which will automatically stop fermenting when it reaches a 4.5pH. In pursuing this effort the R&D department generated a key innovation which has consequently and invariably changed the existing industry-wide standard yoghurt making process. *"It's an intelligent culture! It's called the 'Dream Culture' and Danone had it patented like all its other cultures. Now we use it in our India subsidiary and saving on energy costs there as well"* (Guy Gavelle). The Dream Culture will have significant energy-related cost reduction impacts on all of Danone's future investments in new factories. Furthermore, there is a process of reverse innovation (as per Immelt, Govindarajan and Trimble, 2009; Govindarajan and Ramamurti, 2011) whereby the culture is being used in Danone's Indian subsidiary. Thus, apart from fulfilling a social need, Danone's internal network also benefitted from its need to pursue frugal investments in the creation of GDFL.

The suppliers of process equipments (such as coolers, flow meter, pipes) and packaging equipments were all independent Chinese suppliers outside Danone's regular supplier network. After the process was designed, it was tested at the integrator's facility in Nanjing and shipped to Bogra. Once assembled in Bogra, the process was deemed still too complex for GDFL's purpose and was further simplified through the joint efforts of the GDFL team lead by Guy Gavelle and the integrator's team.

Adhering to the premise of frugal innovations also led to increased embeddedness with the local and regional businesses. *"I looked for utilities which were from India, Bangladesh and China and which were not expensive. And they must be adapted to the country: that is easy to repair. If possible, the suppliers had to have a representative in Bangladesh because it is always difficult when you have problems and there are no local representatives"* (Guy Gavelle). The three systems - process, utilities and packaging machine – for example were connected by hiring a local Bangladeshi engineer who owns a welding company.

Frugal investments also implied that Danone had to rely on donations or find creative ways to outfit GDFL. The electrical system was donated by French MNE Schneider, through its Bangladeshi subsidiary. France's Definox and PCM donated the valves and pumps respectively. Danone's several subsidiaries donated laboratory equipments, vats and even plastic crates. Creative initiatives included hiring a local from Bogra to make inox cable trays which carry electrical wires throughout the factory and cost BDT 5 (about €0.05) per meter while in Danone's home country at the time the cost was €20 to €30 per meter. Another challenge as Guy Gavelle recounts was buying the ammonia compressor to aliment the cold room. *"Finding a supplier here was not easy and it would have been expensive. Or we would have had to import one, again expensive. So I sent the guys to the boat cemetery in Chittagong and asked them to disassemble a compressor from an old boat and bring it here. We still use it to this day to aliment our cold room"* (Guy Gavelle). Hence, the need to be frugal led Danone to tap into a base of social capital and creativity which had remained up to that point untapped and which contributed to its existing base of innovative capabilities.

In February 2007, the GDFL plant began production with a total of 30 employees. From these, half were engaged in process and production activities. In order to launch the social business, Danone brought a team from its Indonesian subsidiary to train the local Bogra employees over a period of 15 days. The team included the Indonesian subsidiary's director and quality control, maintenance and production personnel. The Indonesian team was selected for this task by Danone since their subsidiary, which opened in 2004; resembled GDFL's technological level the most. Guy Gavelleexplained that Danone's more technologically advanced subsidiaries would not have been appropriate, since these were all highly automated.He added, “*This training highly motivated the locals and at the same time, it helped us achieve what we came here to do. Plus they are all Muslims, they were very happy. They didn’t drink alcohol, they went to the mosque together. So there was a formidable relationship between the Indonesian team and the new Bogra team”*. Thus, this internal knowledge socialisation process of sharing production capabilities did not only involve a similar level of technology but also a shared culture.

At the GDFL head office in Dhaka, project management capabilities were being accumulated through a combination of external knowledge acquisition and internal knowledge socialisation process. Danone was adamant that all project management activities for the future construction of GDFL factories, barring the current one, would be handled by the Bangladesh team. The current management committee in Dhaka is composed of the Managing Director, Finance Manager, Supply Chain, Sourcing and Supplier Development (SSD) Manager, Marketing Manager, Human Resources Manager and Retail Manager. All the recruited managers are university graduates and Bangladeshis, for the exception of the Marketing Manager. The internal knowledge socialisation process involved continued interactions with the parent and sister companies. The Finance Manager visited Danone India on several occasions to participate in Danone’s collective training program. He has also been trained for 10 days by the Financial Director of the Greece Danone subsidiary. The SSD manager also spent 10 days in Greece and he was additionally trained by Danone Paris’ SSD Manager during the former’s two 15-day visits to Bangladesh. A member of the local SSD manager’s team was sent to Danone Saudi Arabia’s SSD department. The R&D and Quality manager spent 15 days at Danone France and Spain and visited a factory and the Danone Dairy R&D centre in Paris. The Human Resources Manager completed a one and a half year training program for the whole Asia zone which is an internal Danone training program for the group’s management committee.CorinneBazina, GDFL’s Managing Director, explained the importance of such knowledge socialization process, “*These training opportunities allow the GDFL managers to connect with the Danone network and develop key competencies.”*Interviews with Guy Gavelle and Corinne Bazina revealed that the GDFL teams in Bogra and Dhaka have built the project management capabilities necessary for independently implementing the projected building (in 2013) and start-up of the second GDFL factory located near Dhaka, as well with the continued growth of the Bogra plant. They both listed several accumulated intermediate innovative capabilities such as undertaking tenders and negotiations; conducting feasibility studies; searching, evaluating and selecting technology and raw material sources; new plant start-up.

6.2.2 Capability accumulation for process and production organization activities

When the plant was first built, the requirement for the packaging automated system (a PLC, programmable logic controller) for the yogurt product was that it had to be purchased from an existing Danone supplier, a well-known German MNE. This enterprise has a subsidiary in India and Guy Gavelle recounts the following anecdote. *"I went to see them at their Indian subsidiary and I said: 'I need a PLC for Bangladesh. How much will it cost?'He (representative at Indian subsidiary) said: 'It depends on who is ordering.' I said: 'Well listen, it's Bangladesh, why this question?' He said: 'If it is Bangladesh, you will get a Bangladeshi price and if it is France a French price.'I said: 'But wait, it's made in India, why are you giving me a French price?' He said: 'Well yes, if it is ordered by France, then it's a French price'* (Guy Gavelle). This point reinforces the fact that frugal innovations requires breaking down barriers, having recourse to suppliers which were outside Danone's existing network, which in turn adds to the existing innovative capabilities of the parent company and GDFL.Furthermore, despite having received equipment donations from other MNEs, such breaking down of corporate barriers is deemed necessary until large MNE suppliers and integrators are willing to adjust their prices such social motivated initiatives.

The packaging equipment – the Zhongya – was ordered from an independent Chinese supplier. Once on-site, the Zhongya's supplier installed the equipment and helped run the first trials. Furthermore, Danone aimed at using biodegradable yoghurt pots in Bangladesh. "*There are two suppliers in the world - Cargill in the US and a Chinese one. I opted for the Chinese one, a huge pharmaceutical company which makes biodegradable plastic spoons and forks used in airplanes. They never made yoghurt pots before. I also discussed with the Zhongya supplier and they agreed to adapt their machine for this plastic. We tried it on the Zhongya and it worked really well*" (Guy Gavelle). In this case, both the biodegradable plastic supplier and the Zhongya supplier benefited from reverse learning. This illustrates that frugal investment in a manufacturing-based social businesscan be conducive to inter-industry reverse technological learning linkages which are centred on learning to innovate or interacting for creating innovations.

Accumulation of innovative capabilities in process and production is an on-going aspect at GDFL, which is based mainly on an internal knowledge socialisation process. Maniruzzaman Mohsin, GDFL Quality Control Executive since 2009, recounts that in 2011 they encountered a yoghurt viscosity problem. For a product to be released on the market its texture should be of a certain thickness. The Quality Control team were faced with yoghurt batches which were liquid and which implied a high reject rate. Through interactions with Guy Gavelle, the Bogra Quality Control team learnt how to standardize milk before starting the process in order to overcome such viscosity problems. Thereafter, the team faced a finished yoghurt foaming problem, whereby 2500 litres of product would foam while in the fermentation tank, leading once again to a high reject rate. *"We had to destroy several batches. What we did is we tried to define the sources of the problem. We found out the problem came from the one of our two chilling centres where the milk is stored before it arrives to our factory. We took all the milk to our lab and tested it. We were able to pinpoint which supplier was giving us bitter and adulterated milk which led to the foaming issue."* This highlights the fact that the quality controllers are capable of adopting an independent problem solving and searching through experimentation approach. Aside from those two isolated incidents, Maniruzzaman Mohsin states that GDFL's reject rate for finished yoghurt product is on average less than 1 percent.

The Quality Control team at GDFL consists of a Quality Control and R&D Manager recruited in October 2011, two Quality Control Executives – one of which is also a new recruit - and seven laboratory technicians. Prior to the R&D manager being recruited, R&D was being overseen by Danone Germany. Maniruzzaman Mohsin explained, *"With the new pilot pouch project*[6]*, Germany sent the parameters and specifications for process and production. We did a lot of trials. Sometimes the Germany team came here and I learnt from them and I replicated. Sometimes, I would have to modify the specifications myself. For implementing product modifications, we are quite autonomous, but before implementing process modifications generated here at GDFL, we would have to receive approval from Germany's R&D team first."* The pilot project therefore exemplifies technically assisted design and development of production process through an internal knowledge socialisation process between GDFL and its Germany-based sister company. Moreover, the pilot pouch project demonstrates that GDFL is capable of developing its own product

[6]A full description of the pilot pouch product for the creation of a new to the world dairy product is provided in the following Subsection 6.2.3.

specifications albeit under the approval of Danone Germany. Interviews revealed that such approval processes – mostly with the aim of upholding Danone's food and safety standards - impeded to a large extent GDFL's ability to independently upgrade its innovative capabilities.

In terms of waste management, liquid industrial waste runs to an effluent treatment plant while the solid wastes (mainly plastic) are stored in special dustbins where local vendors can purchase them by the kilo for resale to recycling companies. With regards to market wastage such as market returns of yoghurt, the cups are crushed and the yoghurt is redirected to a biogas chamber which was constructed at the same time as the GDFL. As for the crushed cups and other plastic waste, they are also sold to local vendors for recycling purposes.

6.2.3 Capability accumulation for product-centred activities

When GDFL first started operations, the aim was not to produce premium products like those sold in Danone's other subsidiaries across the globe. The Shokti+ was initially conceived as an affordable plain yoghurt at BDT 5 (€0.05) for an 80 grams pot, reinforced with nutrients for the local children and only a 4-day shelf life due to the lack of an appropriate cold chain to preserve the product once it leaves the factory. Danone's premium products in other countries have shelf lives ranging from 25 to 50 days and cost over 10 times more. Originally, the product was meant to be sold only in Bogra through small shops and by Grameen-Danone ladies (on foot, door-to-door sales ladies). Once the yoghurt would reach the shops and the Grameen-Danone ladies, through simple yet fast transportation channels composed of rickshaws, bicycles and CNGs (gas operated auto-rickshaws), the objective was that the yoghurt would be bought and consumed within the same day.

Before the plant began production operations, the formulation of the product was made in the local GDFL laboratory and sent to Danone's Spain subsidiary where the first product sample was conceived and shipped back to GDFL. Once the factory was operational, trials were run in Bogra with the local milk and the yoghurt was adapted to the local milk's quality. The local milk is low in protein content so the Bogra team incorporated extra protein in the product formulation and market tests were run. The market revealed that the yoghurt did not adhere to the local taste. *"In the beginning the Shokti+ contained 10% sugar and we realized that the locals didn't like the taste of the 10%. It wasn't sweet enough"* (Guy Gavelle). Through a local and internal knowledge acquisition process, based on searching, the GDFL team came across date molasses which is a local natural sweetener. *"Using the date molasses, we increased the sugar content to 13% and this increase is something which could only have been realized locally in our lab, it would have never occurred in another subsidiary as 13% sugar in yoghurt is usually considered too high"* (Guy Gavelle). Furthermore, since date molasses have never been used by Danone before, it had to be tested in Danone Spain in order to be approved as a sweetener by the Group. However, this new yoghurt formulation also underwent further trials at the GDFL. This shows GDFL's capabilities for incremental improvement in product quality and minor product adaptation to the Bangladesh's market. Nevertheless, some reliance on Danone's internal network is required for the purpose of respecting the MNE's food and safety standards.

In terms of quality standards, GDFL applied Danone's specifications since it began operations. The local quality team was trained by Danone to implement these specifications. Furthermore, since GDFL is the first business to sell sealed yoghurt pots on the Bangladeshi market, there were no formalized specifications at the local government's Bangladesh Standard Testing Institute (BSTI). Maniruzzaman Mohsin explained that, *"The BSTI had standards for other dairy products such as pasteurized milk, butter and ghee*[7]*. So based on Guy's (Gavelle) specifications, GDFL went to the BSTI and gave them the standards. People will not buy our yoghurt without the BSTI logo because it is a trusted regulation. However, BSTI got the standards from Danone… We are certified with them so we are in compliance with the Bangladesh standards."* Thus, GDFL's capabilities in terms of quality control standards relied on an internal knowledge socialisation process. Additionally, the local team engaged in a process of knowledge codification which the BSTI benefited from.

Following a 100 percent increase in milk price in April 2008 coupled with the fact that the GDFL was not yet self-sustainable the Grameen JV partners, in consultation with Professor Yunus, decided that the business should expand its customer base to include those with a higher purchasing power. The GDFL would therefore also produce and sell premium yoghurt at a premium price in large cities such as Dhaka, Chittagong and Sylhet through modern trade shops (large supermarkets). This strategic decision had important implications for GDFL's innovative capabilities in terms of product adaptation, cold chain management and quality certification among others. By March 2009, the product range was increased to include valorised mango and strawberry flavoured yoghurts in 60

[7] Ghee is a clarified butter which originates from South Asia and commonly used for cooking.

and 80 grams pot. Since minor product adaption capabilities had already been acquired at this stage by GDFL, the trials and testing for the 2 new flavours were done in-house, as was the case with the recently created 60 grams pot of extra protein plain yoghurt.

With regards to cold chain creation and management, recall that the original Shokti+ was for a 4-day shelf life. With the added sales through modern trade shops and large cities located far from Bogra, the 60 grams pots' shelf-life was extended to 10 days and the 80 grams pots to 20 days. Maniruzzaman Mohsin details how the creation of a cold chain was independently managed by the local Bogra team. Over a period of a few months, the products, after being packaged, were kept in refrigerators and tested. The GDFL Quality Control team found that if they maintained the cold chain, the products' shelf life could be extended to 30 days. So today, after packaging, the products are kept in the cold room for 24 hours. Thereafter, the products are released from Quality Control and sent to the supply chain. The supply chain delivers the products through refrigerated vans and to the various GDFL owned cold rooms in all main markets. From these cold rooms, other refrigerated vans deliver the yoghurt to the modern trade shops where the products are kept in fridges. *"So we are sure that the cold chain is maintained and we have a product shelf life of 20 days. It was very challenging for us to have a cold chain for all our main markets… I had visited a lot for all the distribution areas to ensure that the cold chain was maintained and learnt a lot from this experience"* (Maniruzzaman Mohsin).The accumulation of capabilities related to the cold chain creation and managementwas therefore independently implemented and managed at the level of subsidiary.

Since, GDFL now reaches more consumers, steps are being taken to become HACCP (Hazard Analysis and Critical Control Points) certified, a process managed by the local GDFL quality control team. With a view to increase sales and profits, a new to the world dairy pouch product is currently being tested for launch. It is crucial to present this pilot project due to the fact that it highlights the accumulation of innovative capabilities at the level of GDFL. With the rising price of milk, the pouch – a drinkable fermented dairy product – made with local cereals and unlike yoghurt which uses 80 percent milk, entails 50 percent or less milk. Furthermore, this product if launched on the market will be stored, distributed and sold at ambient temperature with a 20-day shelf life thereby not adding to the existing cold chain capacity. The local raw materials including the cereals for this pilot project were sent to Danone's Germany subsidiary where the first product formulation was made. "*The protocols and formulation were then sent here to GDFL and we implemented it. However, we did further adaptation in terms of process and flavours. The original formulation was for a milky flavour. Then here we did the trials and tests for 25 flavours and settled on 4. Afterwards, GDFL's marketing team did the consumer tests for these 4 flavours. This product is important for our social business because it allows us to reach deep rural areas where people living in poverty don't have refrigerators*" (Maniruzzaman Mohsin). These process and product adaptations and trials in the creation of this new to the world product and the local team's participation in the production feasibility studies demonstrates that intermediate innovative capabilities have been attained under this function.

6.2.4 Capability accumulation for equipment-related activities

In terms of day-to-day operations, GDFL has the capabilities to troubleshoot problems such as those related to the boiler or air compressor. Like Maniruzzaman Mohsin, SadiqHasan, Maintenance-in-Charge since 2006 had previously worked at Bangladesh's BRAC Dairy. He states, "*Big automation problems I cannot fix. When there was a problem with the output card of the server motor on the Zhongya, I needed help because this is an automation problem. But electrical and mechanical side I can manage. When we first started at the GDFL, I set up the ammonia compressor for the cold room. Or when we had a problem with the static frequency convertor – the VLT convertor an electrical component – I called the Fuji distributor in Bangladesh and I fixed the problem"* (SadiqHasan). Nevertheless, GDFL has the capability to maintain the automated Zhongya, however in terms of adaptation and servicing, it relies on the supplier. The accumulation of capabilities in terms of troubleshooting and maintenance of utilities and equipments was primarily through hiring an employee who had a university education and previous work experience in the industry. The latter also implied that Sadiq Hassan has a significant access to local sources of knowledge as illustrated with the Fuji example.

Most of the innovative capability development opportunities came with the pilot pouch project. When GDFL implemented the pilot pouch project, due to its higher viscosity when compared to yoghurt, a new pump, sterilizer and packaging machine had to be installed as part of the process and production organization. To run the pilot project, a temporary packaging equipment - the U-Flex - was ordered from India and delivered in June 2010. The U-Flex is a standard equipment used for dry powdered products such as detergents which are packaged at room temperature. The pouch product is liquid and it has to be packed at 75°C to prevent the cultures from further developing or avoid problems related to bacteria and mould. Since, there are no existing equipments on the global market for packaging a hot liquid product, the U-Flex hadto be modified at GDFL by Guy Gavelle and SadiqHasan forthe purpose at hand. Several of the spare parts in this modification process were made in Bangladesh based on the specifications provided by GDFL. Guy Gavelle explained, *"Since, GDFL is the first place where the pouch product was being tested in the Danone Group, I chose the U-Flex machine to run the pilot project, which costs around €6000. To adapt an existing machine which doses and packages cold powdered products to this end, from a European supplier, can cost up to €400,000. I want to spend a maximum of €30,000 on the final equipment which we will eventually implement."*The original use of U-Flex equipment demonstrates the upgrade of innovative capabilities to the intermediate level, while the development of local spare parts in this process is equally important in terms of local capability spillover effects, both of which were motivated by frugal needs.

As mentioned earlier and based on our interviews, there is no existing equipment which doses hot liquid dairy products. In parallel to undertaking the pilot project, GDFL worked with an Indian subsidiary of a German MNE to develop an equipment which will be implemented and replace the U-Flex once the pilot is completed. The equipment - the Hassia – was modified and created within a year, based on GDFL's specifications. This illustrates that frugal investment in a social business is conducive to inter-industry reverse technological learning linkage centred on collaboration for technology development. While the pilot pouch project was ongoing at GDFL, Danone's Algerian and Indian subsidiaries decided to create a pouch product as well. The first Hassia was implemented in Danone Algeria and the second in Danone India.GuyGavelle stated, *"If the pilot pouch project is successful in Bangladesh, we will purchase the Hassia for GDFL as well. However, at the end of the day, it is through Bogra's pilot project that such technology transfer occurred in the adaption and creation of the Hassia equipment for hot liquid dairy products"*. Thus, there is a synergy in the GDFL case between collaborating with external sources of knowledge for technology development which trickles back to the Danone internal network akin to a reverse innovation process. Furthermore, the global yoghurt industry stands to also benefit from this innovation, as Danone only requires suppliers keep exclusivity over an innovation for a maximum period of one year.

The tubular sterilizer for the pouch product was supplied by Danone's Germany subsidiary and its related spare parts for adaptation to GDFL's process were purchased in Bangladesh. Due to lack of space inside the existing plant, it was installed on GDFL's roof above the process facility. *"I did the whole electrical and mechanical design for the pipelines of the tubular sterilizer; even the plant manager couldn't help me in this process. This is my biggest achievement in the company. In March 2012, the PCM pump was delivered from China. No-one from the supplier came here and I didn't have time to go to their company. So I took it apart and put it back together and that's how I learnt how to design and install it"* (SadiqHasan). Such efforts towards revamping a large equipment without technical assistance, for example, illustrates that the GDFL has attained intermediate innovative capabilities in terms of the equipment-related function.

7. Discussion and Concluding Remarks

In this study we sought to explore the process of technological capability building at the level of a MNE-related social business in the context of a less developed country. We examined this topic on the basis of first-hand empirical evidence gathered through an extensive fieldwork. We have adopted a novel approach for assessing technological capabilities, which is based on a typology that identifies levels of progressively higher levels of complexity and innovativeness of activities related to project management, process and production organization, product-centred and equipment-related. This typology has been tailored to examine technological capability in this particular type of social business model. By doing so, this study unveiled evidence of *production-based* technological activities as well as the development of *innovative* capabilities to the intermediate level for diverse activities (Table 2). Therefore, this study sheds new empirical light on our understanding of technological development in the context of MNE subsidiary in a less developing country. More specifically, this paper generates the following contributions to the field of technological capability building in the context of developing locations, as well as some management and further research implications.

First, by moving beyond most of the existing studies in this field, our study has examined the issue of technological capability development in the context of a social business model. The study has shown that, it is possible to accumulate production-based capabilities and also to move up into the accumulation of progressive higher levels of innovation capabilities across a number of technological functions. The evidence suggests that the manner in which this process of technological capability development proceeds does not differ substantially from the type of technological capability building process proceeds in conventional business firms.

Table 2.Types and Levels of Technological Capabilities Accumulated at GDFL

Levels of technological capabilities		Technological functions			
		Project management	Processes and production organization	Product-centred	Equipment-related
Innovation capabilities	Advanced (Level 4)	Not attained	Not attained	Not attained	Not attained
	Intermediate (Level 3)	Fully attained	Fully attained	Fully attained	Fully attained
	Basic (Level 2)	Fully attained	Fully attained	Fully attained	Fully attained
Production Capabilities	Basic (Level 1)	Fully attained	Fully attained	Fully attained	Fully attained

Source: Derived from triangulation of data from the empirical study.

Therefore, such a process of technological development can be stimulated in different types of organizations beyond the typical firm as an added engine for aiding local industrial development. Through our interviews, it was revealed that the GDFL's previous plant manager, Probir Kumar Sarker, now Chief Engineer at the Dhaka Ice Cream Industries Limited, built and adapted a mini-replica of GDFL's process to ice cream production as part of a pilot project. This shows that spillovers for intersectoral industrial development between a MNE's social business– GDFL - and a domestic firm has already occurred and are therefore potentially possible through manufacturing-based social businesses.

Second, unlike the existing literature which focus primarily the creation of 'new products' that are *less* technologically complex than equivalent products produced by firms in advanced economies,our study provides evidence for frugal and reverse innovations, in 'new process' relatedand*technologically complex* - or R&D intensive - inputs (the Dream Culture) and equipment (the Hassia). These frugally dictated innovations were created for a less developed country context and later adopted in more advanced subsidiaries within Danone's network.

Third, by identifying the accumulation of those types and levels of technological capabilities at the level of this MNE-related social business, this study has argued that the technological capabilities developed at the level of this social business are indeed a locally-driven source of spillover into the host context. In other words, instead of passively receiving directives from its parent company, the local subsidiary, even in the context of a social business model, may independently engage in technological capability development, thus creating a potential source for spillover to its host economy. Therefore, this study throws new empirical light on the debate relative to the role of MNEs in less developed and developing locations. Understanding their processes for technological capability development can help local policy makers in taking added comprehensive measures to involve MNEs as a key component of local policies to achieve development and social changes.

Fourth, by exploring the process of technological capability development at the level of GDFL in Bangladesh our study has contributed to further our understanding of the nature and dynamics of the social business model as a source of local development and social change. So far, relevant existing studies (e.g., Yunus et al., 2010) have focused on financial and social benefits, but not technological benefits generated within these business models. Understanding the nature and dynamics of technological activities in social business models in developing and less developed locations is relevant for the achievement of enhanced local, autonomous and sustainable economic and social development. Such type of evidence is also important to widen our perspective and to stimulate further studies on the potential for more socially concerned types of capitalism.

Fifth, our study carries some managerial implications in terms of highlighting the creative ways in which a MNE can minimize investments (and overall costs) in the setting up of a social business by (i) enlisting a trustworthy local JV partner who can help overcome the local challenges of obstructive bureaucracy; (ii) relying on donations for equipment from sister subsidiaries and other MNEs which are in the investing MNE's existing network; (iii) using local businesses to manufacture utilities or connect different parts of the plant's process; (iv) recycling equipment (e.g., the case of GDFL's ammonia compressor retrieved from an old ship in Chittagong); (v) venturing outside the investing MNE's official network to hire an integrator or purchase equipments and machines from independent low-cost suppliers; and (vi) relying at the start-up stage on a sister subsidiary which has a similar technological level and culture as the social business.

Finally, future studies could explore sources of technological capability development, in particular the role of the various learning processes in influencing the way in which a social business model accumulates, or fails to accumulate, production-based and innovative technological capabilities. Future research could also investigate the role of factors, other than learning in shaping the process of technological development in social businesses, such as the style of leadership and management and the role of factors external to the organization such as local institutional frameworks, including several types of local policy, their existence and/or functioning.

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